What is claimed is:

1. An aqueous polyurethane, prepared by forming a hydrophilic prepolymer by reacting components (a), (b), and (c) in the absence of aliphatic or cycloaliphatic diisocyanates, and chain-extending the hydrophilic prepolymer with component (d):

(a) 10-40 wt% of an aromatic diisocyanate;

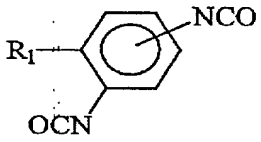
(b) 1-15 wt% of a compound containing active hydrogen and a hydrophilic group or a group capable of forming hydrophilicity;

(c) 30-80 wt% of a polyol; and

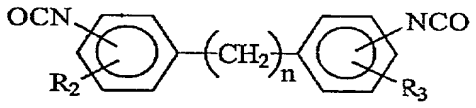
(d) 0.1-5 wt% of a chain extender having active hydrogen.

2. The aqueous polyurethane as claimed in claim 1, wherein the aromatic diisocyanate contains at least one aromatic ring of phenyl, biphenyl, or naphthyl.

3. The aqueous polyurethane as claimed in claim 1, wherein the aromatic diisocyanate is selected from the group consisting of the compounds of formula (I) and (II) and the mixture thereof:



(I)



(II)

wherein R_1 is H or C_{1-6} alkyl; each of R_2 and R_3, independently, is H, C_{1-6} alkyl, C_{1-6} alkoxyl, or C_6 aryl; and n is an integer of 0-3.

4. The aqueous polyurethane as claimed in claim 1, wherein the aromatic diisocyanate comprises toluene diisocyanate (TDI).

5. The aqueous polyurethane as claimed in claim 1, wherein the aromatic diisocyanate comprises p-phenylene diisocyanate (PPDI).

6. The aqueous polyurethane as claimed in claim 1, wherein the aromatic diisocyanate comprises 4,4'-diphenylmethane diisocyanate (MDI).

7. The aqueous polyurethane as claimed in claim 1, wherein the aromatic diisocyanate comprises p,p'-bisphenyl diisocyanate (BPDI).

8. The aqueous polyurethane as claimed in claim 1, wherein the aromatic diisocyanate comprises a mixture of a diisocyanate monomers and dimers or trimers thereof.

9. The aqueous polyurethane as claimed in claim 1, wherein the aromatic diisocyanate comprises a mixture of (a1) TDI or PPDI and (a2) MDI or BPDI, and (a1) constitutes at least 30 mol% of the mixture.

10. The aqueous polyurethane as claimed in claim 1, wherein the aromatic diisocyanate comprises a mixture of (a1) TDI or PPDI and (a2) dimers or trimers of (a1), and (a1) constitutes at least 30 mol% of the mixture.

11. The aqueous polyurethane as claimed in claim 1, wherein the polyol has a number-average molecular weight of about 200-6,000.

12. The aqueous polyurethane as claimed in claim 1, wherein the polyol is selected from the group consisting of polyester polyols, polyether polyols, polycarbonate polyols, polycaprolactone polyols, polyacrylate polyols, and mixtures thereof.

13. The aqueous polyurethane as claimed in claim 1, wherein (b) the compound containing active hydrogen is capable of forming a hydrophilic group selected from the group consisting of $-COO^-$, $-SO_3^-$, N^+R_4 where R is alkyl, $-(CH_2CH_2O)-$, and mixtures thereof.

14. The aqueous polyurethane as claimed in claim 1, wherein (b) the compound containing active hydrogen is selected from the group consisting of dimethylol propionic acid (DMPA), dimethylol butanoic acid (DMBA), polyethylene oxide glycol, bis(hydroxylethyl) amine, sodium 3-bis(hydroxyethyl) aminopropanesulfonate, and mixtures thereof.

15. The aqueous polyurethane as claimed in claim 1, wherein the chain extender is a diamine, triamine, or tetraamine.

16. The aqueous polyurethane as claimed in claim 1, wherein the chain extender is selected from the group consisting of $H_2N-(CH_2)_m-NH_2$ where m is an integer of 0-12, methyl-1,5-pentamethylene diamine, diethylene triamine (DETA), and triethylene tetraamine (TETA).

17. A dried film of the aqueous polyurethane as claimed in claim 1, which exhibits a tensile strength above 320 kg/cm^2 and an ultimate elongation of above 320%.

18. An aqueous polyurethane, prepared by

(A) first reacting (a) 10-40 wt% of an aromatic diisocyanate with (b) 1-15 wt% of a compound containing active hydrogen and a hydrophilic group or a group capable of forming hydrophilicity, to form a diisocyanate-terminated compound containing a hydrophilic group or a group capable of forming hydrophilicity;

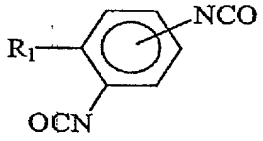
(B) then reacting the diisocyanate-terminated compound with (c) 30-80 wt% of a polyol to form a prepolymer containing a hydrophilic group or a group capable of forming hydrophilicity, and optionally neutralizing the prepolymer;

(C) dispersing the prepolymer in water to form an aqueous dispersion; and

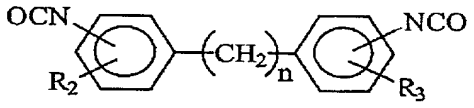
(D) chain-extending the dispersed prepolymer to obtain an aqueous polyurethane dispersion by adding thereto (d) 0.1-5 wt% of a chain extender when the aqueous dispersion has an NCO-content between about 0.8-8.0 wt%.

19. The aqueous polyurethane as claimed in claim 18, wherein the step (A) is conducted at a temperature of about 40-90° C.

20. The aqueous polyurethane as claimed in claim 18, wherein the aromatic diisocyanate is selected from the group consisting of the compounds of formula (I) and (II) and the mixture thereof:



(I)



(II)

wherein R_1 is H or C_{1-6} alkyl; each of R_2 and R_3, independently, is H, C_{1-6} alkyl, C_{1-6} alkoxyl, or C_6 aryl; and n is an integer of 0-3.

21. The aqueous polyurethane as claimed in claim 18, wherein the aromatic diisocyanate comprises toluene diisocyanate (TDI).

22. The aqueous polyurethane as claimed in claim 18, wherein the aromatic diisocyanate comprises p-phenylene diisocyanate (PPDI).

23. The aqueous polyurethane as claimed in claim 18, wherein the aromatic diisocyanate comprises 4,4'-diphenylmethane diisocyanate (MDI).

24. The aqueous polyurethane as claimed in claim 18, wherein the aromatic diisocyanate comprises p,p'-bisphenyl diisocyanate (BPDI).

25. The aqueous polyurethane as claimed in claim 18, wherein the aromatic diisocyanate comprises a mixture of a diisocyanate monomers and dimers or trimers thereof.

26. The aqueous polyurethane as claimed in claim 18, wherein the aromatic diisocyanate comprises a mixture of (a1) TDI or PPDI and (a2) MDI or BPDI, and (a1) constitutes at least 30 mol% of the mixture.

27. The aqueous polyurethane as claimed in claim 18, wherein the aromatic diisocyanate comprises a mixture of (a1) TDI or PPDI and (a2) dimers or trimers of (a1), and (a1) constitutes at least 30 mol% of the mixture.

28. The aqueous polyurethane as claimed in claim 18, wherein the polyol has a number-average molecular weight of about 200-6,000.

29. The aqueous polyurethane as claimed in claim 18, wherein the polyol is selected from the group consisting of polyester polyols, polyether polyols, polycarbonate polyols, polycaprolactone polyols, polyacrylate polyols, and mixtures thereof.

30. The aqueous polyurethane as claimed in claim 18, wherein (b) the compound containing active hydrogen is capable of forming a hydrophilic group selected from the group consisting of $-COO^-$, $-SO_3^-$, N^+R_4 where R is alkyl, $-(CH_2CH_2O)-$, and mixtures thereof.

31. The aqueous polyurethane as claimed in claim 18, wherein (b) the compound containing active hydrogen is selected from the group consisting of dimethylol propionic acid (DMPA), dimethylol butanoic acid (DMBA), polyethylene oxide glycol, bis(hydroxylethyl) amine, sodium 3-bis(hydroxyethyl) aminopropanesulfonate, and mixtures thereof.

32. The aqueous polyurethane as claimed in claim 18, wherein the chain extender is a diamine, triamine, or tetraamine.

33. The aqueous polyurethane as claimed in claim 18, wherein the chain extender is selected from the group consisting of $H_2N-(CH_2)_m-NH_2$ where m is an integer of 0-12, methyl-1,5-pentamethylene diamine, diethylene triamine (DETA), and triethylene tetraamine (TETA).

34. A dried film of the aqueous polyurethane as claimed in claim 18, which exhibits a tensile strength above 320 kg/cm^2 and an ultimate elongation of above 320%.

35. A method of making an aqueous polyurethane dispersion, comprising the steps of:

(A) first reacting (a) 10-40 wt% of an aromatic diisocyanate with (b) 1-15 wt% of a compound containing active hydrogen and a hydrophilic group or a group capable of forming hydrophilicity, to form a diisocyanate-terminated compound containing a hydrophilic group or a group capable of forming hydrophilicity;

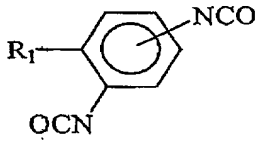
(B) then reacting the diisocyanate-terminated compound with (c) 30-80 wt% of a polyol to form a prepolymer containing a hydrophilic group or a group capable of forming hydrophilicity, and optionally neutralizing the prepolymer;

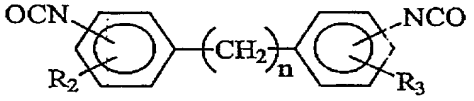
(C) dispersing the prepolymer in water to form an aqueous dispersion; and

(D) chain-extending the dispersed prepolymer to obtain an aqueous polyurethane dispersion by adding thereto (d) 0.1-5 wt% of a chain extender when the aqueous dispersion has an NCO-content between about 0.8-8.0 wt%.

36. The method as claimed in claim 35, wherein the step (A) is conducted at a temperature of about 40-90° C.

37. The method as claimed in claim 35, wherein the aromatic diisocyanate is selected from the group consisting of the compounds of formula (I) and (II) and the mixture thereof:





(I) (II)

wherein R_1 is H or C_{1-6} alkyl; each of R_2 and R_3, independently, is H, C_{1-6} alkyl, C_{1-6} alkoxyl, or C_6 aryl; and n is an integer of 0-3.

38. The method as claimed in claim 35, wherein the aromatic diisocyanate comprises toluene diisocyanate (TDI).

39. The method as claimed in claim 35, wherein the aromatic diisocyanate comprises p-phenylene diisocyanate (PPDI).

40. The method as claimed in claim 35, wherein the aromatic diisocyanate comprises 4,4'-diphenylmethane diisocyanate (MDI).

41. The method as claimed in claim 35, wherein the aromatic diisocyanate comprises p,p'-bisphenyl diisocyanate (BPDI).

42. The method as claimed in claim 35, wherein the aromatic diisocyanate comprises a mixture of a diisocyanate monomers and dimers or trimers thereof.

43. The method as claimed in claim 34, wherein the aromatic diisocyanate comprises a mixture of (a1) TDI or PPDI and (a2) MDI or BPDI, and (a1) constitutes at least 30 mol% of the mixture.

44. The method as claimed in claim 35, wherein the aromatic diisocyanate comprises a mixture of (a1) TDI or

PPDI and (a2) dimers or trimers of (a1), and (a1) constitutes at least 30 mol% of the mixture.

45. The method as claimed in claim 35, wherein the polyol has a number-average molecular weight of about 200-6,000.

46. The method as claimed in claim 35, wherein the polyol is selected from the group consisting of polyester polyols, polyether polyols, polycarbonate polyols, polycaprolactone polyols, polyacrylate polyols, and mixtures thereof.

47. The method as claimed in claim 35, wherein (b) the compound containing active hydrogen is capable of forming a hydrophilic group selected from the group consisting of -COO^-, -SO_3^-, N^+R_4 where R is alkyl, -(CH_2CH_2O)-, and mixtures thereof.

48. The method as claimed in claim 35, wherein (b) the compound containing active hydrogen is selected from the group consisting of dimethylol propionic acid (DMPA), dimethylol butanoic acid (DMBA), polyethylene oxide glycol, bis(hydroxylethyl) amine, sodium 3-bis(hydroxyethyl) aminopropanesulfonate, and mixtures thereof.

49. The method as claimed in claim 18, wherein the chain extender is a diamine, triamine, or tetraamine.

50. The method as claimed in claim 18, wherein the chain extender is selected from the group consisting of H_2N-$(CH_2)_m$-NH_2 where m is an integer of 0-12, methyl-1,5-pentamethylene diamine, diethylene triamine (DETA), and triethylene tetraamine (TETA).